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U.S. Department of Energy
Idaho Operations Office

National Emission Standards for Hazardous Air Pollutants—Calendar Year 2007 INL Report for Radionuclides

June 2008

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Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This report documents the calendar year 2007 radionuclide air emissions and resulting effective dose equivalent to the maximally exposed individual member of the public for the Department of Energy's Idaho National Laboratory Site. This report was prepared in accordance with the Code of Federal Regulations, Title 40, "Protection of the Environment," Part 61, "National Emission Standards for Hazardous Air Pollutants," Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." The effective dose equivalent to the maximally exposed individual member of the public was 9.3E-02 millirem, which is less than the 10-millirem per year federal standard.

CONTENTS

FIGURES

TABLES

ACRONYMS

AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
ANL	Argonne National Laboratory
ARP	Accelerated Retrieval Project
ATR	Advanced Test Reactor
BEA	Battelle Energy Alliance, LLC
BWTS	Basin Water Treatment System
CAP	Clean Air Act Assessment Package
CEM	Continuous Emission Monitoring
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CI	Curies
CITRC	Critical Infrastructure Test Range Complex
CPP	Chemical Processing Plant
CTS	Catch Tank System
CWI	CH2M-WG Idaho, LLC
CY	calendar year
D&D	decommissioning and demolition
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
EBR-II	Experimental Breeder Reactor-II
EDE	effective dose equivalent
EDF	Engineering Design File
EML	Electron Microscopy Laboratory
EPA	Environmental Protection Agency
ETR	Engineering Test Reactor
FAST	Fluorinel and Storage Facility
FCF	Fuel Conditioning Facility
FDP	Fluorinel Dissolution Process
HEPA	high-efficiency particulate air
HFEF	Hot Fuel Examination Facility
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRC	INL Research Center
LLMW	low-level mixed waste
LLW	low-level radioactive waste
L&O	Laboratory and Office Building
MEI	maximally exposed individual
MFC	Materials and Fuels Complex

MREM	Millirem
MTR	Material Test Reactor
MWSF	Mixed Waste Storage Facility
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NRF	Naval Reactors Facility
OCVZ	organic contamination in the vadose zone
OU	operable unit
PBF	Power Burst Facility
PER	Power Excursion Reactor
QC	quality control
RESL	Radiological and Environmental Sciences Laboratory
RH	Remote Handled
RTC	Reactor Technology Complex
RWMC	Radioactive Waste Management Complex
SCMS	Sodium Components Maintenance Shop
SDA	Subsurface Disposal Area
SFE	Storage Facility Exterior
SMC	Specific Manufacturing Capability
SWB	Standard Waste Box
TAN	Test Area North
TRA	Test Reactor Area
TRU	Transuranic
TSF	Technical Support Facility
VCO	Voluntary Consent Order
VES	Vessel
WAG	waste area group
WEDF	Waste Engineering Development Facility
WERF	Waste Experimental Reduction Facility
WIPP	Waste Isolation Pilot Plant
WMF	Waste Management Facility
WROC	Waste Reduction Operations Complex

National Emission Standards for Hazardous Air Pollutants—Calendar Year 2007 INL Report for Radionuclides

1. INTRODUCTION

This report documents radionuclide air emissions for calendar year (CY) 2007 and the resulting effective dose equivalent (EDE) to the maximally exposed individual (MEI) member of the public from operations at the U.S. Department of Energy's (DOE) Idaho National Laboratory (INL) Site. Because of contract changes at the INL Site during CY 2005, some facility names were changed: Argonne National Laboratory-West is now the Materials and Fuels Complex (MFC); the Test Reactor Area (TRA) is now the Reactor Technology Complex (RTC); and the Waste Reduction Operations Complex (WROC)/Power Burst Facility (PBF) is now the Critical Infrastructure Test Range Complex (CITRC).

The title of each section in this report corresponds to reporting requirements found in 40 Code of Federal Regulations (CFR) Part 61.94. A description of the applicable reporting requirements is cited under the titles in italicized text followed by the compliance report for INL Site facilities.

Appendix A contains National Emission Standards for Hazardous Air Pollutants (NESHAP) information specific to the INL Research Center (IRC) located in Idaho Falls, Idaho. Radionuclide emissions from the IRC are not included in the INL Site EDE calculation. Compliance to the 10-mrem-dose standard is demonstrated by limiting the quantities of radioactive materials at the IRC, in accordance with possession limits defined in 40 CFR 61, Appendix E.

Attachment 1 contains NESHAP information specific to the Naval Reactors Facility (NRF) located within the INL Site boundary. The EDE for NRF radionuclide emissions is included in the INL Site EDE to demonstrate overall compliance to the 10-mrem-dose standard set by 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities."

For calendar year 2007, modeling was performed using Clean Air Act Assessment Package (CAP)-88PC, Version 3. Previous years were performed using CAP-88 mainframe.

2. 40 CFR PART 61.94(a) FOREWORD

"Compliance with this standard shall be determined by calculating the highest effective dose equivalent to any member of the public at any offsite point where there is a residence, school, business or office. The owners or operators of each facility shall submit an annual report to both Environmental Protection Agency (EPA) headquarters and the appropriate regional office by June 30, which includes the results of the monitoring as recorded in DOE's Effluent Information System and the dose calculations required by §61.93(a) for the previous calendar year."

This report documents INL Site radionuclide air emissions and the resulting EDE to the MEI for CY 2007. It was prepared in accordance with the 40 CFR 61, Subpart H. As required, this report is submitted to both EPA Headquarters and the appropriate regional office (EPA Region 10) no later than June 30, 2008.

Table 1 reports the annual radionuclide emissions for INL Site sources that were continuously monitored for compliance during CY 2007.

Table 1. Radionuclide emissions, in curies (Ci), from INL Site sources continuously monitored during CY 2007.

Radionuclide	MFC-785-018	MFC-764-001	CPP-708-001	CPP-659-033	ARP 1 [a]	ARP 2 [a]	WMF-676-002 [b]	WMF-676-003 [b]
Am-241	—	—	—	1.2E-08	4.4E-09	8.3E-10	—	—
Ar-41	1.5E+00	—	—	—	—	—	—	—
Co-60	—	—	—	—	—	—	—	—
Cs-137	—	—	4.8E–05	1.2E-07	—	—	—	—
H-3	2.2E+00	1.5E-01	3.5E–01	—	—	—	—	—
I-129	—	—	1.6E–03	—	—	—	—	—
Kr-85	4.7E+00	1.2E+01	—	—	—	—	—	—
Pu-238	—	—	1.9E–07	5.3E-08	—	—	—	—
Pu-239	2.1E-08	—	1.9E–08	3.9E-08	2.6E–09 [c]	—	—	—
Sb-125	—	—	—	—	—	—	—	—
Sr-90	3.2E-07	—	7.1E–06	8.3E–08	—	—	—	—

a. The Accelerated Retrieval Project (ARP) monitoring was performed in accordance with 40 CFR Part 61.93 "Emissions Monitoring and Test Procedures" as an applicable or relevant and appropriate requirement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

b. No measurable emissions in 2007.

c. Analyzed as Pu-239/240.

Historically, the calculated EDE for the INL in Site *National Emission Standards for Hazardous Air Pollutants* (NESHAP) reports has been less than 0.1 millirem (mrem) per year. For CY 2007, the EDE has been calculated at 9.3E-02 mrem per year. The INL EDE is calculated using all sources that emitted radionuclides to the environment. Table 2 lists the sources used to calculate the EDE to the MEI.

Table 2. Sources used to calculate the EDE to the MEI.

Facility	Source
Advanced Mixed Waste Treatment Project (AMWTP):	Waste Management Facility (WMF)-615, Drum Vent Facility
	WMF-628-002, Treatment Tent
	WMF-634, Characterization Facility
	WMF-635, soft-sided containment tent inside WMF-635
	WMF-636, Transuranic Storage Area retrieval enclosure
Central Facilities Area (CFA):	CFA-690-003, 004, 005, 006, 007, 009, 045, 046, 047 and Room 195B; Radiological and Environmental Sciences Laboratory
	Tritium emissions from pumped aquifer water
Critical Infrastructure Test Range Complex (CITRC):	PBF Power Excursion Reactor (PER)-620-016 D&D
Idaho Nuclear Technology and Engineering Center (INTEC):	Chemical Processing Plant (CPP)-602-012, laboratory
	CPP-602-014, laboratory
	CPP-603, Basin Water Treatment System (BWTS)
	CPP-603-001, Irradiated Fuels Storage Facility
	CPP-630-012, laboratory hoods and other exhausts
	CPP-648-002, sludge storage tank (VES-SFE-106)
	CPP-653-001, Mixed Low-Level Waste Project
	CPP-659-033, New Waste Calcining Facility
	CPP-663-002, Hot Shop welding area vent
	CPP-684-001, Remote Analytical Laboratory
	CPP-708-001, Main Stack
	CPP-749-001, Spent Fuel Storage vault vents
	CPP-764-002, Hot Waste Tank vent
	CPP-767-001, FAST Stack
	CPP-1608-001, Manipulator Repair Cell
	CPP-1634, Drum Venting Facility
	CPP-1774-001, Independent Spent Storage Installation
	CPP-1778, sewage lagoons
	CPP-1791, percolation pond
	CPP-2707, dry cask storage
	CPP – disturbed soil
	CPP – undisturbed soil (windblown CPP-88)
	INL Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Disposal Facility Landfill emissions from solid waste disposal
	INL CERCLA Disposal Facility pond emissions
	INL CERCLA Disposal Facility V-Tank

Table 2. (continued).

Facility	Source
Materials and Fuels Complex (MFC):	MFC-704-008, Fuel Manufacturing Facility stack
	MFC-720-007, Transient Reactor Test Facility reactor cooling air exhaust
	MFC-752-004, Laboratory and Office Building (L&O) main stack
	MFC-752-005, L&O nondestructive assay stack
	MFC-764-001, Main Stack (Experimental Breeder Reactor [EBR]-II/Fuel Conditioning Facility (FCF) exhaust)
	MFC-768-105, decontamination shower suspect waste tank vent
	MFC-768-108, Health Physics Area fumehood
	MFC-774-026, Electron Microscopy Laboratory (EML) exhaust
	MFC-774-027, EML exhaust
	MFC-774-028, EML exhaust
	MFC-774-029, EML exhaust
	MFC-777-002, Zero Power Physics Reactor
	MFC-785-018, Hot Fuel Examination Facility stack
	MFC-787-001, Fuel Assembly and Storage Building
	MFC-793-001, Sodium Components Maintenance Shop stack
	MFC-793A-025, 027, 029, 031, 033, 035; Alcohol Storage Tank vents
	MFC-794-006, Contaminated Equipment Storage Building exhaust
	MFC-798-017, Radioactive Liquid Waste Evaporator exhaust
Naval Reactors Facility (NRF)	See Attachment 1
Reactor Technology Complex (RTC):	Test Reactor Area (TRA)-604-035, laboratory fumehood exhausts from Buildings 604 and 661
	TRA-604-074
	TRA-632 (019, 030, 041), Hot Cells
	TRA-635
	TRA-642, Engineering Test Reactor (ETR) Building D&D
	TRA-661-008, Radiochemistry wing extension fumehoods and storage room exhausts
	TRA-642, Engineering Test Reactor (ETR) Building D&D
	TRA-665
	TRA-670-074, Advanced Test Reactor (ATR) Chemistry Laboratory fumehood exhaust
	TRA-670-086, laboratory
	TRA-670-098, laboratory
	TRA-710-001, Material Test Reactor (MTR) stack
	TRA-715, Warm Waste Evaporation Pond
	TRA-770-001, ATR main stack
	ATR canal
	Containerized waste handling
	Building D&D of MTR and associated buildings
	Removal and disposal of the ETR vessel

Table 2. (continued).

Facility	Source
Radioactive Waste Management Complex (RWMC):	Accelerated Retrieval Project I & II
	Accelerated Retrieval Project I & II Fugitive Emissions
	H-3 from groundwater
	Organic contamination in the vadose zone exhaust
	SDA buried beryllium blocks
	Subsurface Disposal Area (SDA) buried boxed waste
Test Area North (TAN) Specific Manufacturing Capability (SMC):	629-013, manufacturing process, Line 2A
	679-022, manufacturing process, north process
	679-023, manufacturing process, north process
	679-024, manufacturing process, north process
	679-025, manufacturing process, south process
	679-026, manufacturing process, south process
	679-027, manufacturing process, south process
	681-018, Process Reclamation Facility
	681-020, Process Reclamation Facility
TAN Technical Support Facility (TSF):	Operable Unit (OU) 1-07B, New Pump and Treat Facility
	TAN New Sites (TSF-46) soil removal
	TAN V-tank soil removal
	TAN-607 D&D
	TAN 633 Soil Remediation
	TAN-734-001,
	TAN-633 decommissioning and demolition (D&D)

40 CFR 61, Subpart H requires DOE facilities to calculate the resulting dose to the offsite MEI. As in previous years, Frenchman's Cabin was the location of the INL Site MEI for CY 2007 (see Figure 1). The EDE to the MEI was 9.3E-02 mrem/yr (9.3E–07 sievert), which is less than the 10-mrem/yr federal standard. Table 3 provides a summary of the INL Site MEI dose by facility and source type.

Table 3. INL facility dose (mrem) contributions and total INL Site dose (mrem) to the MEI located at Frenchman's Cabin for CY 2007 radionuclide air emissions.

Facility	Point Sources	Fugitive Sources	Total
AMWTP	6.9E-05	NA	6.9E-05
CFA	2.0E-09	3.0E-05	3.0E-05
CITRC	NA	1.1E-03	1.1E-03
INTEC	1.4E-02	1.9E-02	3.4E-02
MFC	2.4E-05	NA	2.4E-05
NRF	7.7E-05	2.7E-06	7.9E-05
RTC	7.3E-03	2.3E-03	9.6E-03
RWMC	3.7E-06	2.4E-02	2.42-02
TAN-SMC	4.4E-11	NA	4.5E-11
TAN-TSF	2.5E-09	2.4E-02	2.4E-02
Total INL Site Dose			9.3E-02

a. NA= Not Applicable

3. 40 CFR PART 61.94(b)(1)

"Name and location of the facility."

Site Name: Idaho National Laboratory (INL) Site.

Site Location: The INL Site encompasses approximately 890 mi^2 on the upper Snake River Plain in southeastern Idaho (see Figure 1). The INL boundaries closest to population centers are approximately 22 mi (35.3 km) west of Idaho Falls, 23 mi (37 km) northwest of Blackfoot, 44 mi (70.8 km) northwest of Pocatello, 7 mi (11.3 km) east of Arco, 1 mi (1.6 km) north of Atomic City, 3 mi (5 km) west of Mud Lake, and 4 mi (6 km) east of Howe.

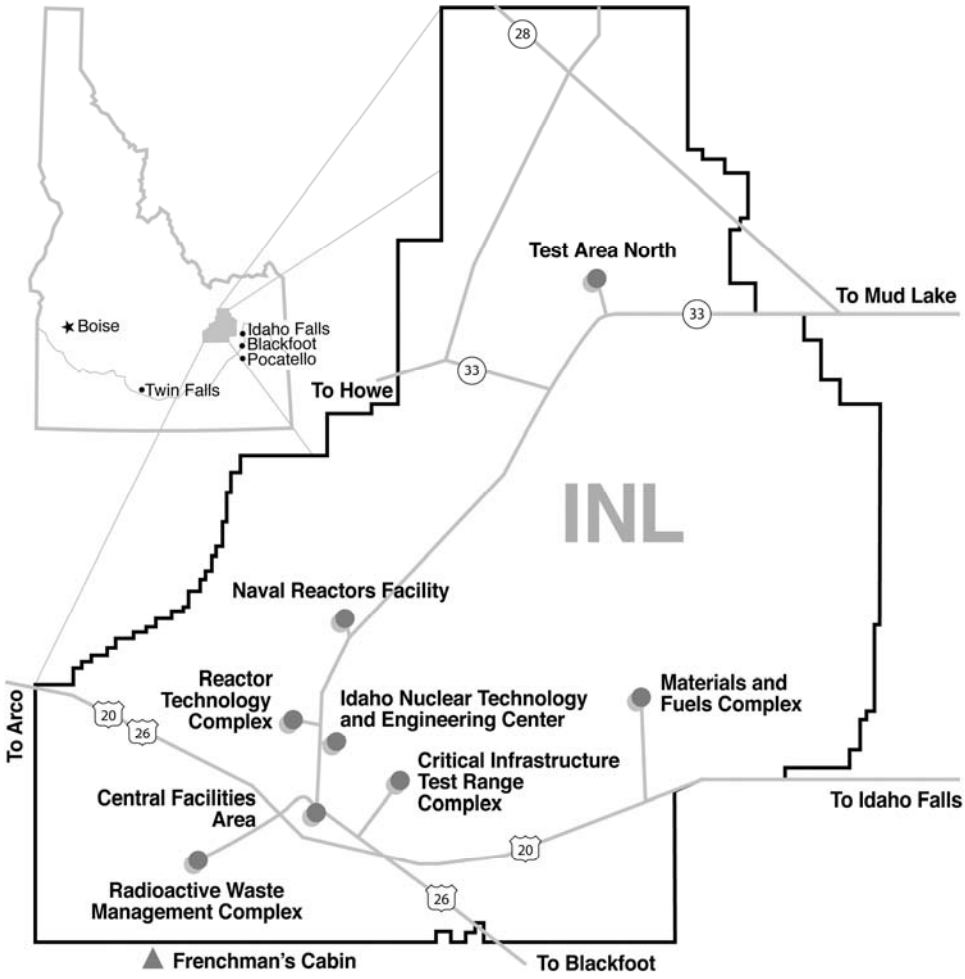

Figure 1. INL Site, including major facility areas and off-Site MEI located at Frenchman's Cabin.

4. 40 CFR PART 61.94(b)(2)

"A list of the radioactive materials used at the facility."

The individual radionuclides found in materials used at the INL Site during CY 2007 are listed in Table 4. These materials include, but are not limited to, samples, products, process solids, liquids, and waste that have potential emissions.

Table 4. Radionuclides in use and potentially emitted to the atmosphere from INL Site facilities in CY 2007.

Ac-227	Cs-137	Ni-59	Sn-126
Ag-110	Cs-138	Ni-63	Sr-89
Ag-110m	Eu-152	Np-237	Sr-90
Am-241	Eu-154	Np-239	Sr-91
Am-242m	Eu-155	Pa-231	Sr-92
Am-243	Fe-55	Pb-210	Tc-99
Ar-41	Fe-59	Pb-211	Tc-99m
Ba-133	Fr-223	Pb-212	Te-125m
Ba-139	H-3	Pb-214	Th-227
Ba-140	Hf-181	Pd-107	Th-228
Ba-141	Hg-203	Pm-147	Th-230
Be-7	I-125	Po-210	Th-231
Bi-210	I-129	Po-218	Th-232
Bi-211	I-131	Pr-144	Tl-207
Bi-212	I-132	Pu-236	Tl-208
Bi-214	I-133	Pu-238	U-232
C-14	I-134	Pu-239	U-233
Ce-141	I-135	Pu-240	U-234
Ce-144	Ir-192	Pu-241	U-235
Cf-252	K-40	Pu-242	U-236
Cm-242	Kr-85	Ra-223	U-238
Cm-243	Kr-85m	Ra-224	W-187
Cm-244	Kr-87	Ra-226	Xe-131m
Cm-245	Kr-88	Rb-89	Xe-133
Cm-246	Mn-54	Ru-103	Xe-133m
Cm-247	Mo-99	Ru-106	Xe-135
Co-57	Na-22	Sb-124	Xe-135m
Co-58	Na-24	Sb-125	Xe-138
Co-60	Nb-94	Sc-46	Zn-65
Cr-51	Nb-95	Sm-151	Zr-93
Cs-134	Nb-95m	Sn-113	Zr-95
Cs-135			

5. 40 CFR PART 61.94(b)(3)

"A description of the handling and processing that the radioactive materials undergo at the facility.

5.1 AMWTP Retrieval, Characterization, and Treatment Activities

The Advanced Mixed Waste Treatment Project (AMWTP) is located at the RWMC in the southwestern corner of the INL Site. The AMWTP received approval from DOE to begin retrieving and characterizing mixed and low-level waste on March 28, 2003. On August 17, 2004, the Advanced Mixed Waste Treatment Facility (AMWTF) received approval from the DOE to begin hot operations. The AMWTP had eight potential sources of radionuclides in operation during CY 2007. Radiological air emissions from the AMWTP result from the retrieval, characterization, and treatment of transuranic waste, alpha-contaminated low-level mixed waste (alpha LLMW), and LLMW. The goal of the AMWTP is to produce final waste forms that are certified for disposal.

5.2 Central Facilities Area

The Central Facilities Area (CFA) is located in the south-central section of the INL Site. CFA provides services that support the following INL Site facilities:

- DOE Radiological and Environmental Sciences Laboratory (RESL; CFA-690)
- Maintenance shops
- Vehicle maintenance facilities
- Calibration laboratories
- Communications and security systems
- Fire protection
- Medical services
- Warehouses
- Other support services facilities
- Decontamination and decommission and remediation activities.

With the exception of RESL, operations at CFA are conducted by Battelle Energy Alliance, LLC (BEA) or CH2M-WG Idaho, LLC (CWI) under DOE Idaho Operations Office administration. RESL is operated directly by the DOE-ID.

Minor emissions occur from CFA facilities where work with small quantities of radioactive materials is routinely conducted. This includes analytical services for environmental samples at RESL. Other minor emissions result from research and development laboratory operations and groundwater usage.

5.3 Critical Infrastructure Test Range Complex

The Critical Infrastructure Test Range Complex (CITRC) is located in the south-central portion of the INL Site, about 5 miles east of CFA. CITRC consists of five distinct operation areas: Power Burst Facility (PBF) Control Area, Waste Engineering Development Facility (WEDF), PBF Reactor Area, Waste Experimental Reduction Facility (WERF), and Mixed Waste Storage Facility (MWSF). The WEDF, WERF, and the MWSF are used by BEA for research activities and training.

During CY 2007, radiological air emissions from CITRC resulted from partial decommissioning and demolition (D&D) of the PBF Reactor Building (PER-620). These D&D activities were conducted by CWI.

5.4 Idaho Nuclear Technology and Engineering Center

The Idaho Nuclear Technology and Engineering Center (INTEC) is located in the southern portion of Idaho National Laboratory (INL) and was constructed in 1950. It was operated for Department of Energy Idaho Operations Office (DOE-ID) by CH2M-WG Idaho, LLC (CWI) for this reporting period (CY-07).

Radiological air emissions from INTEC are primarily associated with spent nuclear fuel management (e.g., fuel receipt and wet and dry storage areas) and liquid waste facility closure activities (e.g., Tank Farm Facility, Evaporator Tank System, Process Equipment Waste Evaporator, Liquid Effluent Treatment and Disposal). These radioactive emissions include noble gases, iodines, and other mixed fission and activation products. Additional radioactive emissions are associated with decontamination and debris treatment activities, sample analysis, site remediation, Remote Handled Transuranic (RH-TRU) waste management, radiological and hazardous waste accumulation areas, and other miscellaneous emissions from radioactively contaminated buildings and liquids in tanks.

5.5 Materials and Fuels Complex

The MFC is located in the southeastern corner of the INL Site. MFC, a research facility operated by BEA, is involved in advanced nuclear power research and development, spent fuel and waste treatment technologies, national security programs, and projects to support space exploration.

Radiological air emissions are primarily associated with spent fuel treatment at the Fuel Conditioning Facility (FCF) and post-irradiation examination at the Hot Fuel Examination Facility (HFEF). Both of these facilities are equipped with continuous emission monitoring (CEM) systems. On a monthly basis, employees sample and analyze the effluent stream from FCF, HFEF, and other monitored (non-CEM) radiological facilities for particulate radionuclides. FCF and HFEF are also sampled monthly for gaseous radionuclides. Minor amounts of gaseous and particulate radionuclides may also be released during laboratory analysis, radioactive material handling and storage, and maintenance operations. Both measured and estimated emissions from MFC sources are consolidated for NESHAP reporting on an annual basis.

5.6 Reactor Technology Complex

The Reactor Technology Complex (RTC) is located in the south-central section of the Idaho National Laboratory (INL). The RTC has facilities for studying the performance of reactor materials and equipment components under high neutron flux conditions. The major facility at RTC is the Advanced Test Reactor (ATR). Other operations at RTC include hot cell operations, research and development, site remediation, analytical laboratory services, and facility decommissioning and demolition activities.

Radiological air emissions from RTC are primarily associated with operation of the ATR. These emissions include noble gases, iodines, and other mixed fission and activation products. Other radiological air emissions are associated with hot cell operations, sample analysis, site remediation, research and development activities, and facility decommissioning and demolition activities.

Demolition of remaining auxiliary and support facilities for the Engineering Test Reactor (ETR) Complex and removal of the ETR vessel were completed during CY 2007. Structures that were decontaminated and/or demolished during this period that were potential sources of radiological

emissions include the ETR Reactor Building (TRA-642), the ETR Electrical Building (TRA-648), and the ETR Filter Pit Building (TRA-755). Backfilling of below-grade portions of TRA-642 will continue during CY 2008. Demolition preparatory activities, such as removal of tanks, piping, and equipment, were also performed at the Material Test Reactor (MTR) Complex in Buildings TRA-603, -604, -626, -635, -654, and -665. Demolition of the MTR Plug Storage Building (TRA-657) was completed in CY 2007.

5.7 Radioactive Waste Management Complex

The Radioactive Waste Management Complex (RWMC), located in the southwestern corner of INL, is a controlled-access area with a primary mission to safely dispose of INL-generated, low-level radioactive waste (LLW) and to temporarily store contact-handled and remote-handled transuranic waste that will be shipped to other designated facilities for disposal. In addition, various activities are being conducted in the Subsurface Disposal Area at the RWMC to complete environmental cleanup of the area, such as waste retrieval activities and operation of several units that extract volatile organic compounds from the subsurface. To fulfill these missions, the RWMC maintains facilities and processes in separate areas for administrative and operations support, and waste storage and disposal. Administrative and Operations Area buildings are used for security and access control, personnel offices, lunchrooms, change and shower rooms, equipment and materials storage, craft and maintenance shops, and radiological control. This section covers the Operations at the RWMC conducted by CWI, under the administration of DOE-ID and does not include those operations performed by other contractors under the administration of DOE.

5.8 Test Area North

Test Area North (TAN) is the northernmost developed area within INL. It was originally established to support the Aircraft Nuclear Propulsion Program, which operated from 1951 to 1961. Since 1961, TAN buildings have been adapted for use by various other programs, including current BEA operations at the Specific Manufacturing Capability (SMC) and D&D activities performed by CWI at the Technical Support Facility (TSF).

5.8.1 Specific Manufacturing Capability

The SMC Project is a manufacturing operation that produces an armor package for the U.S. Department of the Army. The SMC Project was assigned to the INL Site in mid-1983. Operations at SMC include material development, fabrication, and assembly work to produce armor packages. The operation uses standard metal-working equipment in fabrication and assembly. Other activities include developing tools and fixtures and preparing and testing metallurgical specimens. Radiological air emissions from SMC are associated with the processing of depleted uranium; potential emissions are uranium isotopes and associated radioactive progeny.

5.8.2 Technical Support Facility

Radioactive air emissions from the TSF during CY 2007 are primarily associated with the D&D of buildings and structures and environmental remediation.

6. 40 CFR PART 61.94(b)(4) and (5)

"A list of the stacks or vents or other points where radioactive materials are released to the atmosphere. A description of the effluent controls that are used on each stack, vent, or other release point and an estimate of the efficiency of each control device."

Tables 5 through 13 list the facility stacks, vents, or other points where radioactive materials were released to the atmosphere during CY 2007.

Table 5. Stacks, vents, or other points of radioactive materials release to the atmosphere at AMWTP.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
615	001	Drum Vent Facility	Two HEPA filters	99.97% each
628	001	Waste Characterization Facility	None	NA
628	002	Drum Treatment Tent	Two HEPA filters	99.97% each
634	001	Characterization Facility		
		Drum Vent Facility	Two HEPA filters	99.97% each
		Drum Coring	Three HEPA filters	99.97% each
635	001	Soft-sided containment tent	One HEPA filter	99.97%
636	001	Transuranic Storage Area-Retrieval Enclosure	None	NA
676	002	Zone 3 Stack	Three HEPA filters	99.97% each
676	003	Glovebox stack	Three HEPA filters	99.97% each

Table 6. Stacks, vents, or other points of radioactive materials release to the atmosphere at CFA.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
690	003	RESL	None	NA
690	004	RESL	None	NA
690	005	RESL	None	NA
690	006	RESL	None	NA
690	007	RESL	None	NA
690	009	RESL	None	NA
690	045	RESL	None	NA
690	046	RESL	None	NA
690	047	RESL	None	NA

Table 7. Stacks, vents, or other points of radioactive materials release to the atmosphere at CITRC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
620	016	PBF Main Reactor Stack	HEPA filter	99.97%

Table 8. Stacks, vents, or other points of radioactive materials release to the atmosphere at INTEC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
602	012	Main exhaust for laboratory hoods, gloveboxes, and denitrator	HEPA filter or two HEPA filters in series	99.97% each
602	014	Laboratory hoods and other exhausts	HEPA filter	99.97%
603	001	Irradiated Fuel Storage Facility	Two HEPA filters in series	99.97% each
630	012	Laboratory hoods and other exhausts	Two HEPA filters in series	99.97% each
648	002	Sludge Storage Tank (VES-SFE-106)	HEPA filter	99%
653	001	Mixed Low-Level Waste Project	HEPA filter	99.97%
659	033	New Waste Calcining Facility, calciner area heating, ventilating, and air conditioning system	Two HEPA filters in series	99.97% each
663	002	Maintenance building hot shop vent	HEPA filter	99.97%
684	001	Remote Analytical Laboratory	Two HEPA filters in series	99.97% each
708	001	INTEC Main Stack	HEPA filter or up to three HEPA filters in series	99.97% each
764	002	Vault containing hot waste tank (VES-SFE-126)	HEPA filter	99%
767	001	Fluorinel and Storage Facility (FAST) stack	HEPA filter or two HEPA filters in series	99.97% each
1608	001	Manipulator Repair Cell	Two HEPA filters in series	99.97% each
1634	001	Venting CH TRU and RH TRU containers, head-space gas sampling CH TRU and RH TRU containers	HEPA filter	99.97%

Table 9. Stacks, vents, or other points of radioactive materials released to the atmosphere at MFC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
704	008	Fuel Manufacturing Facility stack	Two HEPA filter banks[a] in series	99.97% each
720	007	Transient Reactor Test Facility reactor cooling air exhaust	Two HEPA filter banks in series	99.97% each
752	004	Laboratory and Office (L&O) Building main stack	Two HEPA filter banks in series	99.97% each
752	005	L&O Building nondestructive assay building stack	Two HEPA filter banks in series	99.97% each
764	001	Main Stack	EBR-II—HEPA filter bank FCF—Two HEPA filter banks	99.97% each
768	105	Decontamination shower suspect waste tank vent	None	NA
768	108	Health Physics area fumehood	HEPA filter bank	99.97%
774	026	Electron Microscopy Laboratory (EML) exhaust	Two HEPA filter banks in series	99.97% each
	027	EML exhaust	Two HEPA filter banks in series	99.97% each
	028	EML exhaust	Two HEPA filter banks in series	99.97% each
	029	EML exhaust	Two HEPA filter banks in series	99.97% each
777	002	Zero Power Physics Reactor exhaust	Two HEPA filter banks in series	99.97% each
785	018	Hot Fuel Examination Facility stack	Two HEPA filter banks in series	99.97% each
787	001	Fuel Assembly and Storage Building	HEPA filter bank	99.97%
793	001	Sodium Components Maintenance Shop (SCMS) stack	HEPA filter bank	99.97%
793A	025 027 029 031 033 035	Alcohol storage tank vents	None	NA
794	006	Contaminated Equipment Storage Building exhaust	HEPA filter bank	99.97%
798	017	Radioactive Liquid Waste Treatment Facility	HEPA filter bank	99.97%

a. Bank includes multiple HEPA filters.

Table 10. Stacks, vents, or other points of radioactive materials release to the atmosphere at RTC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
604	035	Vents various laboratory fumehoods and gloveboxes in buildings TRA-604 and TRA-661	HEPA filter	99.97%
604	074	TRA-604 Room 110 fumehood exhaust	None	NA
632	019	Hot Cell #3	HEPA filter	99.97%
632	030	Hot Cell #2	HEPA filter	99.97%
632	041	Hot Cell #1	HEPA filter	99.97%
661	008	Vents various laboratory fumehoods and gloveboxes in the radiochemistry wing extension	HEPA filter	99.97%
670	074	Laboratory 124 fumehood exhaust	HEPA filter	99.97%
670	086	Laboratory 131 fumehood exhaust	HEPA filter	99.97%
670	098	Laboratory 103 fumehood exhaust (two hoods)	HEPA filter	99.97%
710	001	MTR Main Stack	Partial HEPA filter[a]	99.97%
770	001	ATR Main Stack	None	NA

a. HEPA filters are on the effluent from the MTR Canal area, the Safety and Tritium Applied Research Facility, and miscellaneous equipment within TRA-604 and TRA-661.

Table 11. Stacks, vents, or other points of radioactive materials release to the atmosphere at RWMC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
697	1	Accelerated Retrieval Project (ARP)	HEPA filter	99.97%
1612	1	Accelerated Retrieval Project (ARP-2)	HEPA filter	99.97%
SDA	NA	Organic Contaminated Vadose Zone (OCVZ)-Vacuum Vapor Extraction Stack-Unit D (WAG 7)	None	None
SDA	NA	OCVZ-Vacuum Vapor Extraction Stack-Unit E (WAG-7)	None	None
SDA	NA	OCVZ-Vacuum Vapor Extraction Stack-Unit F (WAG-7)	None	None

Table 12. Stacks, vents, or other points of radioactive materials release to the atmosphere at SMC.

Bldg	Vent	Source Description	Effluent Control Description	Efficiency
629	013	Line 2A (RAD Stack #3) manufacturing process	Two HEPA filter banks	99.97% each
679	022	North process (RAD Stack #11) manufacturing process (EF-206) and includes releases from the quality control (QC) laboratory	One HEPA filter bank	99.97%
679	023	North process (RAD Stack #10) manufacturing process (EF-205) and includes releases from the QC laboratory	One HEPA filter bank	99.97%
679	024	North process (RAD Stack #9) manufacturing process (EF-204) and includes releases from the QC laboratory	One HEPA filter bank	99.97%
679	025	South process (RAD Stack #8) manufacturing process (EF-203)	One HEPA filter bank	99.97%
679	026	South process (RAD Stack #7) manufacturing process (EF-202)	One HEPA filter bank	99.97%
679	027	South process (RAD Stack #6) manufacturing process (EF-201)	One HEPA filter bank	99.97%
681	018	Process Reclamation Facility	One HEPA filter bank	99.97%
681	020	Process Reclamation Facility	One HEPA filter bank	99.97%

Table 13. Stacks, vents, or other points of radioactive materials release to the atmosphere at TSF.

Bldg.	Vent	Source Description	Effluent Control Description	Efficiency
734	001	Main Exhaust Stack for the Hot Shop, Hot Cell, and Hot Cell Annex, Hot Cell Annex, SES Room	One to three HEPA filters in series	99.97% (one set tested per area)
WAG-1		OU-107B Air Stripper	None	NA

7. 40 CFR PART 61.94(b)(6)

"List distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk, and meat."

Table 14 shows distances from the points of release to the nearest residence, school, business or office, and the nearest farms producing vegetables, milk, and meat.

Table 14. Distances from INL facility points of release to the nearest off-Site receptor location and to Frenchman's Cabin (INL MEI).

Facility	Distance and Direction to Nearest Residence, School, Farm, or Business	Distance and Direction to Frenchman's Cabin
MFC	8,678 m[a] SSE	37,219 m WSW
CFA	12,453 m SE	14,359 m SW
INTEC	15,333 m SSE	18,718 m SSW
NRF	13,714 m NNW	26,675 m SSW
CITRC	10,775 m SSE	20,140 m SW
RWMC/AMWTP	7,976 m SSW	7,976 m SSW
TAN	10,344 m E	54,611 m SSW
SMC	12,298 m E	54,405 m SSW
RTC	17,421 m NW	19,172 m SSW

a. m = meters.

8. 40 CFR PART 61.94(b)(7)

"The values used for all other user-supplied input parameters for the computer models (e.g. meteorological data) and the source of these data."

Tables 15 and 16 show the CAP-88 modeling input parameters for CY 2007.

Table 15. User-supplied input parameters for CAP-88.

Variable	Value	Explanation
TSUBB	100 (years)	Buildup time in soil.
GRID Parameters (NO and NR)	Varies	These are direction (sector number) and distance to receptor, which vary depending on facility and receptor.
METE LID	800 (m)	Average annual atmospheric mixing layer height. Value is from the National Oceanic and Atmospheric Administration (NOAA).
RR	16.3 (cm)	2007 average value for central INL (Grid 3)
TA	7.1 C	2007 average value for central INL (Grid 3)
Humidity	3.54 gm/cm3	From 50% annual average relative humidity at CFA (DOE/ID-12118)
Z	Varies	Height above ground of meteorological measurements. Values for INL vary from 10 m to 80 m, depending on station (see Table 16). Upper-level Zs are used for stack releases.

Table 16. INL Site meteorological files and wind measurements (Z) heights.

Facility	Lower Level	Z Value (m)	Elevated	Z Value (m)
MFC	EBRL(yr)	10	EBRU(yr)	80
CFA	690L(yr)	15		
INTEC	GRIL(yr)	10	GRIU(yr)	61
CITRC	PBFL(yr)	15		
RWMC/AMWTP	RWML(yr)	15		
TAN/SMC	LOFL(yr)	10	LOFU(yr)	45
RTC	TRAL(yr)	15		
NRF	NRFL(yr)	15		

9. 40 CFR PART 61.94(b)(8)

"A brief description of all construction and modifications which were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived under §61.96 and associated documentation developed by DOE to support the waiver. EPA reserves the right to require that DOE send to EPA all the information that normally would be required in an application to construct or modify, following receipt of the description and supporting documentation"

A soft-sided confinement tent (WMF 628-002 Drum Treatment Tent) was placed in WMF 628 Storage Module. This tent is double-HEPA filtered to maintain a negative pressure. Activities that take place in this tent include adding absorbent material to drums, decanting liquid from drums, relidding drums, removing an inner container (either a drum or intact liner) from a drum, and loading standard waste boxes (SWBs).

Closure actions associated with Voluntary Consent Order (VCO) to close systems associated with the Fluorinel Dissolution Process (FDP) in-cell operation within the Fluorinel Dissolution Process and Fuel Storage (FAST/CPP-666) were performed at the Idaho Nuclear Technology and Engineering Center (INTEC) (EDF-8336). Dose was estimated at 1.03E-02 mrem.

Deactivation and demolition of the Experimental Test Reactor (EDF-7766) were completed. Dose was estimated at 9.26E-06 mrem.

Numerous CERCLA contaminated soil sites were remediated and nonessential structures, facilities, and utilities at the INL Site were removed. CERCLA sites include: CPP-130; CPP-19 (located outside the SE corner of the CPP-749 underground Fuel Storage Facility fence, just east of Maple Street); CPP-8, -9, -10 (located along the north and east perimeter of the "CPP-603 Addition"); CPP-1, -4, -5 (CPP-740 settling basin and SW-048, -301, -303 dry wells); and CPP-11 (soils above the SFE-106 tank vault). This work also supports RCRA closure requirements and commitments, including removal of the SFE-106 and -20 Tank Systems & Piping (including PLA-100115). Ancillary scope includes removal of CPP-1677, SFE-126 tank, CPP-764 vault (EDF-7900). Dose was estimated at 2.5E-02 mrem.

The drum venting process was previously reported in the CY 2006 report but required reevaluation. The original vent and filter were designed to penetrate the lid of the drum while maintaining an effective seal, and to avoid penetration or disturbance of any inner packaging or containers. A longer vent and filter was utilized, and the process was reevaluated (EDF-8216). Dose was estimated at 1.4 E-03 mrem.

Clean closure of TRA-630 Catch Tank System (CTS) components, which have been determined to be contaminated with transuranic (TRU) isotopes, was completed. The closure of the TRA-630 CTS TRU-contaminated components involved stabilizing, cutting, and disposing of the piping and the pump vault at Waste Isolation Pilot Plant (WIPP), due to their remote-handled TRU waste characteristics. The catch tanks and supporting equipment have been decontaminated to meet clean closure (EDF-8189). Dose was estimated at 1.55 E-04 mrem.

Side-punching of waste drums met the requirement for WIPP disposal. The side punches were 0.438 in. in diameter, and penetrated no more than 4 in. into the inner waste containers. Operations were conducted at INTEC (EDF-8504). Dose was estimated at 2.94 E-03 mrem.

Appendix A

INL Research Center

Appendix A
INL Research Center

Compliance with the 10-mrem dose standard is demonstrated by use of 40 CFR 61, Appendix E.[a] A comparison of the January 1, 2007, inventory, plus all receipts received during the calendar year, with the Appendix E limits appears in Table A-1. This table shows the quantity of radioactive material possessed during the calendar year is less than the Appendix E limits.

Table A-1. 40 CFR 61 Appendix E compliance table.

Radionuclide	Physical State of Inventory	IRC Inventory[a] (Ci)	Appendix E Possession Limit (Ci)	NESHAPS Ratio[b]
C-14	Liquid/powder	3.6E-03	2.9E+02	1.3E-05
Cs-137	Liquid/powder	6.6E-06	2.3E-02	2.9E-04
Co-60	Liquid/powder	1.5E-08	1.6E-02	9.4E-07
H-3	Liquid/powder	5.8E-05	1.5E+04	3.8E-09
I-125	Liquid/powder	2.9E-06	6.2E+00	4.6E-07
Kr-85	Gas	1.0E-09	8.4E+02	1.2E-12
Ni-63	Liquid/powder	1.1E-08	1.4E+02	7.9E-11
Pu-239	Liquid/powder	1.0E-10	2.5E-03	4.0E-08
Pu-241	Liquid/powder	3.0E-11	1.3E-01	2.3E-10
Pu-242	Liquid/powder	2.0E-12	2.5E-03	8.0E-10
Pu-244	Liquid/powder	7.8E-14	2.4E-03	3.3E-11
S-35	Liquid/powder	1.3E-03	7.5E+01	1.7E-05
Sr-90	Liquid/powder	2.2E-08	5.2E-01	4.3E-08
Tc-99	Liquid/powder	3.5E-08	9.0E+00	3.8E-09
U-234	Liquid/powder	2.6E-05	7.6E-03	3.5E-03
U-235	Liquid/powder	1.2E-06	7.0E-03	1.7E-04
U-238	Liquid/powder	2.6E-05	8.6E-03	3.0E-03
Xe-133	Gas	6.9E-02	5.2E+01	1.3E-03
			Sum of Ratios	8.3E-03

a. Includes 1/1/07 inventory plus all materials received in CY 2007.

b. NESHAPS Ratio is IRC Inventory divided by Appendix E Possession Limit. The Sum of Ratios must be less than 1.

a. J. Leitch, Region 10 EPA, letter dated July 5, 1996, in response to John E. Medema letter, "40 CFR 61 Subpart H Compliance for the Idaho National Laboratory Research Center (IRC)," OPE-EP-96-181, dated June 11, 1996 to Ms. Ann Frankel.

40 CFR 61.94(b)

"In addition to paragraph (a), the annual report will include the following information:"

40 CFR 61.94(b)(1)

"The name and location of the facility."

Idaho National Laboratory (INL) Research Center (IRC) facilities are located on a partially developed 14.3-hectare (35.5-acre) plot on the north side of the City of Idaho Falls. Though programs and operations at the IRC are affiliated with INL, the IRC is located within the city limits of Idaho Falls and is not contiguous with INL Site, the nearest boundary of which is approximately 22 mi west of Idaho Falls.

Facilities at the IRC include office, laboratory, and technical support buildings. The largest is a three-story office building connected by an enclosed walkway to a one-story laboratory building containing 66 laboratories. Other buildings at the IRC include the Research Office Building, Physics Building, Electric Vehicle Building, and Systems Analysis Facility.

40 CFR 61.94(b)(2)

"A list of the radioactive materials used at the facility."

See Table A-1.

40 CFR 61.94(b)(3)

"A description of the handling and processing that the radioactive materials undergo at the facility."

The IRC is principally an experimental research facility dedicated to a wide range of research areas, including microbiology; geochemistry; materials characterization; welding; ceramics; thermal fluids behavior; materials testing; nondestructive evaluation of materials using standard industrial x-ray processes, x-ray diffraction, and x-ray fluorescence; analytical and environmental chemistry; and biotechnology.

40 CFR 61.94(b)(4)

"A list of the stacks or vents or other points where radioactive materials are released to the atmosphere."

Radiological emissions from the IRC could arise from uncontrolled laboratory fumehoods within the facility. Exhaust from most of the fumehoods is released directly to the outside atmosphere via the heat recovery fan system of the IRC heating, ventilating, and air conditioning system. The heat recovery fan system exhausts to the outside via vents on the north side of the mechanical penthouse on top of the IRC laboratory building. Stack height of these vents is 7.6 m (25 ft). The exhausts from other fume hoods (not exhausted to the heat recovery fan) are released to the atmosphere via a 2.1-m (7-ft) stack above the roof or two 8.5-m (28-ft) stacks above the roof.

Emissions can occur from other areas as well. Not all radiological emissions will occur from work in a fumehood. Some work is done on work benches or in bay areas. Work with radionuclides could be done anywhere at the IRC. The most likely places include Building 603, System Analysis Facility, and INL Engineering Demonstration Facility.

40 CFR 61.94(b)(5)

"A description of the effluent controls that are used on each stack, vent, or other release point and an estimate of the efficiency of each control device."

No effluent control equipment is associated with any of the IRC's release points.

40 CFR 61.94(b)(6)

"Distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk, and meat."

The nearest business is 0.1 km (0.0620 mi) north of the IRC.

Consistent with 40 CFR 61, Appendix E, no residence is within 10 m of the IRC, and no vegetables, milk, or meat are produced within 100 m of the IRC.

40 CFR 61.94(b)(7)

"The values used for all other user-supplied input parameters for the computer models (e.g., meteorological data) and the source of these data."

Not applicable. 40 CFR 61 Appendix E used for compliance.

40 CFR 61.94(b)(8)

"A brief description of all construction and modifications that were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived under § 61.96 and associated documentation developed by DOE to support the waiver."

None.

Attachment 1

Naval Reactors Facility National Emission Standards for Hazardous Air Pollutants—Radionuclides Annual Report for 2007

BETTIS-IDAHO

Calendar Year 2007

Naval Reactors Facility

National Emission Standards for Hazardous Air Pollutants

Report on 2007 Radionuclide Emissions

Prepared for the U.S. Department of Energy
by Bechtel Bettis, Incorporated
Under Contract No. DE-AC11-98PN38206

U. S. Department of Energy
Radionuclide Air Emissions Annual Report
(under Subpart H of 40 CFR Part 61)
Calendar Year 2007

Site Name: Idaho National Laboratory (INL)
Area: Naval Reactors Facility (NRF)

Area Information for NRF

Operator: Bechtel Bettis, Incorporated
Address: P. O. Box 2068
Idaho Falls, Idaho 83403-2068
Contact: M. A. DiBattista, Manager, Naval Reactors Facility
Phone: (208) 533-5526

Owner: Naval Reactors Idaho Branch Office
Address: P. O. Box 2469
Idaho Falls, Idaho 83403-2469
Contact: J. Roros, Manager, Naval Reactors Idaho Branch Office
Phone: (208) 533-5317

I. FACILITY INFORMATION

Site Description

The fenced portion of the Naval Reactors Facility (NRF) covers 84 acres of 4400 acres under the cognizance of NRF, in the west-central part of the Idaho National Laboratory (INL) site (Figure 1). NRF is located approximately 6.7 miles (10.8 kilometers) from the nearest INL border. The nearest residence is 8.5 miles (13.7 kilometers) NNW of NRF. The nearest population center is Howe which is located approximately 10.1 miles (16.2 kilometers) NNW of NRF. Section III provides specific information concerning the distances to locations used for dose modeling.

The climate of the INL is characterized as semi-arid. The INL is located on the Snake River Plain with an elevation of approximately 5000 feet (1500 meters), and it is surrounded by mountains. Air masses entering the Snake River Plain from the west lose most of their moisture to precipitation prior to encountering the INL; therefore, annual precipitation at the INL is light. Winds are channeled over the Snake River Plain by bordering mountain ranges so that a southwest wind predominates over the INL. The second most frequent winds are from the northeast. The average air temperature, average wind speed, and the average precipitation are included in the CAP-88 computer code calculations.

Established in 1949, NRF is operated for the U. S. Naval Nuclear Propulsion Program by Bechtel Bettis, Inc., Bettis Atomic Power Laboratory-Idaho. The principal facilities at NRF are three former naval reactor prototypes (S1W, A1W, and S5G) and the Expended Core Facility (ECF). The S1W, A1W, and S5G prototypes were shut down in October 1989, January 1994, and May 1995, respectively.

Developmental nuclear fuel material samples, naval spent fuel, and irradiated reactor plant components/materials are examined at ECF. The knowledge gained from these examinations is used to improve current designs and to monitor the performance of existing reactors. The naval spent fuel examined at ECF is critical to the design of longer-lived cores, which results in the creation of less spent fuel requiring disposition. NRF also prepares and packages spent naval fuel for dry storage and eventual transportation to a permanent geologic repository.

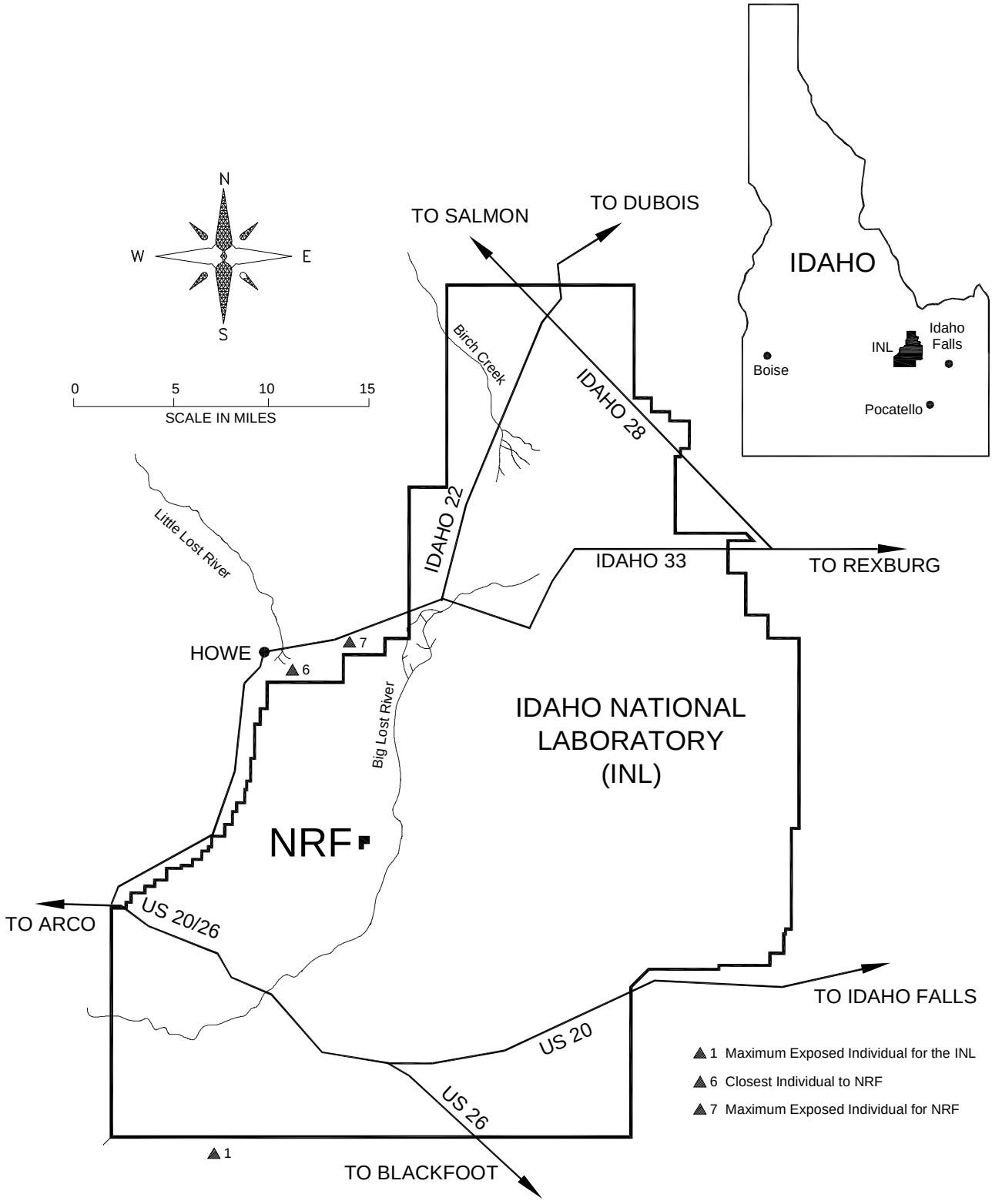

Figure 1. Relation of NRF to the INL.

Source Descriptions

NRF receives spent fuel and radioactive components from the U. S. Naval Nuclear Propulsion Program, shipped in Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) approved shipping containers in accordance with Department of Transportation requirements. The shipments are processed and examined at ECF.

Radioactive materials at NRF include enriched uranium fuel with associated fission products, activation products, and activated corrosion and wear products. Various sources are used for calibrating and checking equipment, verifying shielding, and performing radiography. Soil with low levels of radioactivity from fallout and from past operations is also present at NRF.

Radioactive materials are handled and processed in several areas at NRF, including shielded hot cells, chemical and metallurgical laboratories, machine shops, and radioactive material storage areas. Physical, chemical, and metallurgical testing of small quantities of highly radioactive material specimens is performed in the ECF shielded hot cells. Radioactive work conducted within the ECF highbay water pools consists of unloading radioactive specimens from shipping containers, fuel examinations, removal of non-fuel structural pieces, and storage of fuel. Segregation and repackaging of radioactive waste are performed within the S5G highbay, and decontamination of inactive radiological systems proceeds throughout NRF controlled areas. Radioactive work is performed in appropriate containment. Storage and movement of radioactive materials are under strict control. Machine shops are used to perform machining operations such as turning, milling, and drilling on a variety of metal components. Special laboratory facilities are available for the chemical analysis of potentially radioactive and low-level radioactive samples.

All radioactive material is controlled by a radioactive material accountability system and maintained in designated storage areas. All movements of radioactive material within the facility are performed under escort of qualified radiological controls personnel and tracked in the accountability system.

Radioactive liquids are used to support operations. Radioactive liquids may be processed through a series of filters and demineralizers for reuse. Radioactive liquids that cannot be reused are solidified for disposal as radioactive waste.

Disposable materials and waste products associated with the handling of radioactive materials are controlled and tracked as radioactive waste. The waste is temporarily stored on-site in designated storage areas until sufficient quantities accumulate to comprise a shipment to a DOE low-level disposal site.

Radionuclide emissions to the atmosphere can come from three main sources at NRF:

(1) ECF, where spent fuel from naval cores and contaminated materials such as anti-contamination clothing, tools, and other equipment are handled. Radioactive water is present in the pits where the fuel is located. Analyses are performed on radioactive materials in chemistry laboratories in this building.

(2) S1W, A1W, and S5G Prototype Reactors. Although the reactors have been shut down and defueled, routine inspections of the reactor compartments are conducted and the ventilation from these facilities is monitored. At the S5G prototype, contaminated materials such as tools, equipment, anti-contamination clothing, and contaminated waste are handled. Analyses are performed on radioactive materials in chemistry laboratories in the A1W prototype building.

(3) Fugitive Soil Emissions, from areas surrounding NRF which potentially contain low levels of radioactivity in the soil that are exposed to the wind.

II. AIR EMISSIONS DATA

NRF has a number of stacks and vents with the potential to emit low quantities of radionuclides. These emissions are monitored and calculated by NRF. The data are included in the calculation of the INL's annual effective dose equivalent (EDE) to members of the public.

Continuous monitoring is required by 61.93(b) of 40 CFR 61, Subpart H, for emission points that have a potential to emit radionuclides in quantities that could result in an EDE to a member of the public in excess of 1 percent of the 10 millirem (1×10^{-4} sievert) per year standard, which is 0.1 millirem (1×10^{-6} sievert). None of the emission points at NRF qualify for the continuous monitoring requirement; all emission points are below the 0.1 millirem (1×10^{-6} sievert) per year criteria. Confirmatory evaluations are performed as needed to verify that emissions are below 1 percent of the standard.

Table II-1 identifies potential point sources of radionuclide air emissions. The table contains identification codes for area, building, and vent; a general description; a description of the effluent controls and their efficiencies, if applicable; and those emission sources that were monitored.

Table II-2 identifies potential fugitive sources of radionuclide air emissions. The table contains codes for area, location, and identification number; and a general description. There was no effluent control or monitoring for the fugitive sources.

Tables II-3 and II-4 list the combined radionuclide emissions from the point sources and fugitive sources. The tables include measured values for those radionuclides that are routinely monitored and calculated values for those radionuclides that are not monitored. For determining the EDE, the gross alpha radioactivity is conservatively modeled as plutonium-239 and the gross beta radioactivity is conservatively modeled as strontium-90 with yttrium-90 daughter progeny.

Table II-1. Potential Radiological Air Emission Point Sources at NRF During 2007

Nearest Residence, School, Business or Farm: 13.7 kilometers NNW				
AREA -BLDG -VENT No.	SOURCE DESCRIPTION	EFFLUENT CONTROL DESCRIPTION	EFFICI-ENCY [1]	MONI-TORED [2]
NRF-601-023	S1W REACTOR COMPARTMENT	NONE [3]	NA	No
NRF-601-HBRV	S1W HIGH BAY ROOF VENTS	NONE [3]	NA	Yes
NRF-616-012, 021	A1W OPERATIONS BUILDING AND SITE CHEMISTRY	NONE [3]	NA	Yes
NRF-616-PCMA	A1W PRIMARY COMPONENTS MAINTENANCE AREA AND EXTENSION	NONE [3]	NA	No
NRF-617-013	A1W REACTOR COMPARTMENT 3A	HEPA FILTER	99.95%	Yes
NRF-617-020	A1W REACTOR COMPARTMENT 3B	HEPA FILTER	99.95%	Yes
NRF-618-099	ECF STACK NUMBER 1	HEPA FILTER CARBON FILTER	99.95% 99.9%	Yes+
NRF-618-103	ECF STACK NUMBER 2	HEPA FILTER	99.95%	Yes+
NRF-618-237	ECF STACK NUMBER 3	HEPA FILTER	99.95%	Yes+
NRF-618-HBRV	ECF HIGH BAY ROOF VENTS	NONE [3]	NA	Yes
NRF-633A-057	S5G RADIOACTIVE AREA VENTILATION (RAV) SYSTEM	HEPA FILTER	99.95%	Yes
NRF-633A-HBRV	S5G HIGH BAY ROOF VENTS	NONE [3]	NA	Yes

1. HEPA filters are tested by the manufacturer prior to delivery to NRF and by NRF during the life of the filter. The manufacturer tests the efficiency for 0.3-micron monodispersed dioctylphthalate (DOP) particles to a minimum of 99.97 percent. NRF tests the efficiency for 0.7-micron polydispersed DOP particles to a minimum of 99.95 percent.

2. "No" indicates that the source was not monitored during 2007 because it did not operate during 2007.
   "Yes" indicates that the source was monitored, and the measured emissions are included in this report.
   "Yes+" indicates that the source was monitored, and both measured and calculated emissions are included in this report. (Because some gaseous radionuclides could not be measured, the amounts of these radionuclides were calculated based on the amount of process production.)

3. Subsystems that exhaust within the areas ventilated by these sources may have HEPA filters.

Table II-2. Potential Radiological Air Emission Fugitive Sources at NRF During 2007

Nearest Residence, School, Business or Farm: 13.7 kilometers NNW				
AREA-LOCATN-I.D. CODE	SOURCE DESCRIPTION	EFFLUENT CONTROL DESCRIPTION	EFFI-CIENCY	MONI-TORED
NRF-SOIL-003	FUGITIVE SOIL: SOUTHWEST SEWAGE LAGOON (NOT IN USE)	NONE	NA	No
NRF-SOIL-004	FUGITIVE SOIL: NRF PERIMETER AREA	NONE	NA	No

Table II-3. Point Source Releases From NRF During 2007

Radionuclide	Symbol	Release (curies)	Release (becquerels)*
Carbon-14	C-14	6.0E-01	2.2E+10
Gross alpha (modeled as plutonium-239)	Pu-239	3.2E-06	1.2E+05
Gross beta (modeled as strontium-90 /yttrium-90)	Sr-90 /Y-90	5.8E-05	2.1E+06
Tritium	H-3	2.9E-01	1.1E+10
Iodine-131	I-131	6.8E-06	2.5E+05
Iodine-129	I-129	5.8E-06	2.1E+05
Krypton-85	Kr-85	5.4E+00	2.0E+11
Antimony-125	Sb-125	3.6E-03	1.3E+08
Tellurium-125m	Te-125m	8.8E-04	3.3E+07
Radon-220	Rn-220	3.2E-04	1.2E+07
Total		6.3E+00	2.3E+11

* One curie equals 3.7E+10 becquerels.

Table II-4. Fugitive Source Releases From NRF During 2007

Radionuclide	Symbol	Release (curies)	Release (becquerels)*
Cobalt-60	Co-60	4.0E-08	1.5E+03
Cesium-137 /Barium-137m	Cs-137 /Ba-137m	1.6E-04	5.9E+06
Total		1.6E-04	5.9E+06

* One curie equals 3.7E+10 becquerels.

III. DOSE ASSESSMENTS

Summary

Table III-1 summarizes the EDE results for point sources, fugitive sources, and all sources combined. The EDE from all NRF sources at the receptor receiving the highest dose is 1.8×10^{-4} millirem (1.8×10^{-9} sievert) and occurred at a location 9.8 miles (15.8 kilometers) north of NRF (Figure 1, Location 7). The NRF EDE is for information only; it is the EDE from all INL sources combined that is used to show compliance with the 40 CFR 61.92 standard.

Table III-1. Effective Dose Equivalents from Sources at NRF During 2007

Release Point	EDE [1] (mrem)	EDE [1] (Sv) [2]
1. Point Sources	1.75E-04	1.75E-09
2. Fugitive Sources	5.25E-06	5.25E-11
Total:	1.8E-04	1.8E-09

1. The EDE shown is for the NRF maximally exposed individual (Figure 1, Location 7).
2. One millirem equals 1.0E-05 sievert (Sv).

Description of Dose Model and Summary of Input Parameters

General

The CAP-88 computer code (PC Version 3) was used to calculate the EDE from the NRF releases. CAP-88 is approved for use by the Environmental Protection Agency (EPA) for demonstrating compliance with 40 CFR 61 Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." The output from CAP-88 is the EDE, which includes the 50-year committed EDE (CEDE) from internal exposure through the ingestion and inhalation pathways and the external EDE from ground deposition and air immersion.

Site-specific 2007 wind data was used, collected by the National Oceanic and Atmospheric Administration (NOAA) from the 15-meter tower at NRF. Ten year average INL rainfall and temperature were used, and long-term average INL humidity was used to simplify data input for the many INL facilities, since these parameters have little effect on the results. An average annual atmospheric mixing layer height of 800 meters was used, per NOAA.

The dose from all daughter progeny is automatically included by the CAP-88 program. Some radionuclides such as cesium-137 and strontium-90 have daughter progeny which emit radioactivity which is as significant as the parent's radioactivity.

Point Sources

Modeling guidance states that if the release height of an emission point is less than or equal to 2 ½ times the building height from which the stack emerges, then building downwash will lower the release height. For conservatism, all emissions from NRF stacks and vents were modeled as ground-level point emissions.

Fugitive Sources

Fugitive soil releases, included in fugitive sources, were calculated using soil resuspension rates based on average annual wind speed. The method used for determining resuspension rates is described in DOE/TIC-22800, Transuranic Elements in the Environment, by Wayne C. Hanson. Fugitive sources were modeled as ground-level releases.

Compliance Assessment

Maximally Exposed Individual

Subpart H of 40 CFR 61 requires that emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts which would cause any member of the public to receive in any year an EDE of 10 millirem (1×10^{-4} sievert) per year. "Member of the public" is any offsite point where there is a residence, school, business, or office. For compliance purposes, this EDE is calculated for all emission sources on the INL. The EDE calculated for NRF is for information only; the emissions used for the NRF EDE have been included in the INL calculation of the EDE for the maximally exposed individual.

Various receptors near the INL boundary were evaluated when calculating the highest EDE for 2007. The nearest receptor to NRF is a residence located approximately 8.5 miles (13.7 kilometers) to the north-northwest of NRF (Figure 1, Location 6), but it did not receive the highest dose. The receptor that received the highest dose from NRF is a residence located approximately 9.8 miles (15.8 kilometers) to the north of NRF (Figure 1, Location 7). The nearest receptor did not receive the highest dose because it was less in the direction of the prevailing winds. The receptor that received the highest dose from all INL sources combined is located approximately 16.6 miles (26.7 kilometers) to the south-southwest of NRF (Figure 1, Location 1). The EDE results presented for NRF are for the receptor that received the highest dose from NRF (Figure 1, Location 7).

Statement of Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this report, the Naval Reactors Facility National Emission Standards for Hazardous Air Pollutants Report on 2007 Radionuclide Emissions. Based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See 18 U.S.C. 1001.

Owner Signature: _____ 5/23/09
(J. Roros) (Date)

Title: Manager, Naval Reactors Idaho Branch Office

For: Naval Reactors Facility

IV. ADDITIONAL INFORMATION

The EPA requires in 40 CFR 61 Subpart H that a "brief description of all construction and modifications which were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived" be included.

There were no construction projects or modifications at NRF during 2007 which fall under this requirement.

V. SUPPLEMENTAL INFORMATION

The following information is provided at the request of DOE Headquarters and is not required as part of the annual National Emission Standards for Hazardous Air Pollutants reporting requirements (under 40 CFR Section 61.94).

REQUEST: Provide an estimate of the collective effective dose equivalent (person-rem per year) for 2007 releases.

An estimate of the collective effective dose equivalent (person-rem per year) will be provided in the *Idaho National Laboratory Site Environmental Report for Calendar Year 2007*.

REQUEST: Provide information on the status of compliance with Subparts Q and T of 40 CFR Part 61 if pertinent.

Subpart Q of 40 CFR Part 61, "National Emission Standards for Radon Emissions From Department of Energy Facilities," is applicable to the design and operation of storage and disposal facilities for radium-containing material that emit radon-222 into the air. Subpart Q is not applicable to the Naval Reactors Facility. Subpart T of 40 CFR Part 61, "National Emission Standards for Radon Emissions From the Disposal of Uranium Mill Tailings," is not applicable to the Naval Reactors Facility.

REQUEST: Provide information on radon-220 emissions from sources containing uranium-232 and thorium-232 where emissions potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

The Naval Reactors Facility does not have any sources of uranium-232 or thorium-232 emissions that potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

REQUEST: Provide information on non-disposal and non-storage sources of radon-222 emissions where emissions potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

The Naval Reactors Facility does not have any non-disposal or non-storage sources of Radon-222 emissions that potentially can exceed 0.1 millirem (1×10^{-6} sievert) per year to the public or 10 percent of the non-radon dose to the public.

REQUEST: For the purpose of assessing facility compliance with the National Emission Standards for Hazardous Air Pollutants effluent monitoring requirements of Subpart H under Section 61.93(b), give the number of emission points subject to the continuous monitoring requirements, the number of these emission points that do not comply with the Section 61.93(b) requirements, and if possible, the cost for upgrades. Describe site periodic confirmatory measurement plans. Indicate the status of the quality assurance program described by Appendix B, Method 114.

The Naval Reactors Facility does not have any emission points that require continuous monitoring under Section 61.93(b). However, confirmatory measurements were accomplished by calculating the maximum unabated emissions for radiological emission points at NRF to determine if continuous monitoring is required under Section 61.93. Periodic confirmatory measurements were also accomplished by use of calculations and samples to determine the actual emissions in 2007.

Although NRF does not require continuous monitoring, a quality assurance (QA) program is incorporated into the environmental monitoring program. The QA program includes equipment calibration, the use of blanks and known standards, and the annual review and validation of radioactive airborne emission data by independent peer reviewers.